Electron Paramagnetic Resonance Spectrum of Hydrogen Atoms Stabilized on Solid Surfaces   SOV/51-6-4-27/29

quartz it is close to 0.8 oersted (curve 1 in a figure on p 566), on silica gel it is near 2.4 oersted (curve 2) and on molybdenum glass it is 4.5 oersted (curve 3). Since the hyperfine splitting in the e.p.r. spectra of H atoms stabilized on various surfaces is close to the hyperfine splitting of free atoms, the binding of H atoms to these surfaces does not alter greatly the spin density of the unpaired electron in hydrogen. On the other hand, dependence of the width of the hydrogen doublet components on the nature of the stabilizing surface indicates that there is a definite interaction between the unpaired electron and the surface. In view of this the authors suggest further studies of the nature of binding of H atoms to solid surfaces. This is an abridged translation. There is 1 figure and 4 references, 2 of which are Soviet and 2 English.

SUBMITTED: August 29, 1958

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24 (7), 5 (4)
AUTHORS: Kachkurova, I. Ya., Polak, L. S.,   SOV/48-23-10-32/39
                  Topchiyev, A. V., Chernyak, N. Ya.

TITLE: Investigation of the Radiolysis of Alkanes by Means of the
                  Ultraviolet- and Infrared Spectra

PERIODICAL: Izvestiya Akademii nauk SSSR. Seriya fizicheskaya, 1959,
                  Vol 23, Nr 10, pp 1253 - 1255 (USSR)

ABSTRACT: In the radiolysis of alkanes the bonds C-C and C-H break off;
                  in the gaseous phase hydrogen (80-85%) is liberated, as well as
                  various hydrocarbon gases (CH_4, C_2H_6, etc); radicals of the
                  type C_nH_{2n+1} are formed when atomic hydrogen is broken off, the
                  breaking off of H_2 leads to the formation of olefins and of $2H_2$
                  to formation of dienes and polyenes. The chemical analysis of
                  the liquid radiolysis products (0.1 - 1.0%) is so difficult
                  that the only possible method of determining them is that of
                  the absorption spectra. The authors chose heptane and other
                  normal hydrocarbons as objects for their investigation. The
                  irradiation of the liquid and gaseous samples was carried out
Card 1/3   with Co^{60}-γ-rays in evacuated glass ampoules. Measurement of

Investigation of the Radiolysis of Alkanes by Means of   SOV/48-23-10-32/39
the Ultraviolet- and Infrared Spectra

the absorption spectra was carried out at the Opticheskaya laboratoriya INEOS (Optical Laboratory of the INEOS): The uv-spectra by means of the spectrovisor (an automatically recording spectrophotometer), the ir-spectra by means of an automatically recording VIKS-11-spectrometer. The liquid radiolysis products were investigated in the ranges 25,000 - 45,000 and 700 - 2,000 cm^{-1}. Figure 1 shows the uv-spectra recorded in irradiated normal hydrocarbons: Hexane, heptane, octane, dodecane, cetane. The thickness of the absorbing layer was d = 0.5 cm. The curves are shown by a diagram $D/d : \nu$; the results obtained are briefly discussed. The absorption intensities in the uv-range increase linearly with an increase in the irradiation dose. The maximum doses were about 150.10^6 r. Figure 2a shows the dependence of absorption intensity on the molecular composition of the irradiated hydrocarbon, figure 2b shows the dependence of intensity on the irradiation dose for heptane. Figure 3 shows the uv-absorption spectrum of cetane, which was irradiated at various temperatures (dose 1.10^7r).

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Investigation of the Radiolysis of Alkanes by Means of   SOV/48-23-10-32/39
the Ultraviolet- and Infrared Spectra

A reduction of temperature exercises no influence upon the character of the spectrum, but absorption intensity increases. Several details of this temperature effect are discussed. The absorption coefficient of heptadiene at 44,000 cm^{-1} was determined as amounting to 26,000 and the molar diene concentration occurring in a γ-irradiation ($\sim 10^8 r$) in heptane was calculated. $3.5 \cdot 10^{-4} g$ mol/liter was the result obtained. There are 3 figures.

ASSOCIATION: Institut neftekhimicheskogo sinteza Akademii nauk SSSR (Institute for Petroleum-chemical Synthesis of the Academy of Sciences, USSR). INEOS Akademii nauk SSSR (INEOS of the Academy of Sciences, USSR)

Card 3/3

5 (4)

AUTHORS: Polak, L. S., Temkin, A. Ya.   SOV/20-125-3-33/63

TITLE: On the Theory of Radiation Chemistry (K teorii radiatsionnoy khimii)

ABSTRACT: The present paper deals with two problems: The taking into account of the interaction of the tracks and the method of approximate calculation of the quantity of the free radicals and final products of the (γ- and β-) radiolysis. The taking into account of the track structure, of its volume distribution and interaction is important for the investigation of the radiation-chemical reactions with low yields (~ 10 molecules per 100 ev). The reactions of chain character are by far less important. In the investigation of radiation-chemical reactions of non-chain character, (to which belong, for instance, the radiation cracking of hydrocarbons, some kinds of radiation polymerization, nitration, and many other reactions) high densities of the ionizing radiation must be applied in order to obtain a great yield of the final product per unit of time. High radiation densities,

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On the Theory of Radiation Chemistry

naturally, cause the interaction of the tracks. It is necessary, therefore, to take into account the mutual influence of the tracks of various ionizing particles if the density of the ionizing radiation is high. In this case the theory of radiation chemistry can be formulated as follows: It is necessary to find (for the instant of time t) the variation of the distribution of the ions and free radicals (in the irradiated medium) which is caused by the formation of a track of given initial distribution of the ions and radicals in the instant of time $t_o = t - t'$. An equation for the time dependence of the density of the particles of the free radicals or ions is deduced. This equation, however, describes bimolecular reactions and does not take into account the possibility of secondary reactions. The authors then investigate some special cases: If a radiation of high density acts on polymers, there is nearly no diffusion of the polymer radicals. In the case of reactions with yield of atomic hydrogen at high radiation densities the corresponding system of equations must contain an equation which describes the diffusion and various types of reactions of hydrogen atoms. The above-

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On the Theory of Radiation Chemistry   SOV/20-125-3-33/53

> . mentioned system of equations is then specialized and adapted
> for the case of low radiation densities, and the authors
> discuss a method for the approximate solution of this
> simplified system of equations. The formulae deduced then
> permit the computation of the number of free radicals and
> final products of the radiolysis. The method discussed in the
> present paper may be applied also to calculations by means of
> an electronic computer of discrete action. There are
> 3 references, 1 of which is Soviet.

ASSOCIATION: Institut neftekhimicheskogo sinteza Akademii nauk SSSR (Institute
              for Petroleum-chemical Synthesis of the Academy of Sciences
              USSR)

PRESENTED: December 11, 1958, by A. V. Topchiyev, Academician

SUBMITTED: December 10, 1958

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PoLAK, L.S.

9 (9)

AUTHORS: Topchiev, A. V., Academician, Corresponding SOV/20-128-2-25/59
B. A.; Berlin, A. A., Academician, Krentsel',
B. A.; Kislovich, I. E.; Polak, L. S.

TITLE: On the Possibility of Producing Polymer-Materials With
Semiconductor Properties From Polyacrylnitrile

PERIODICAL: Doklady Akademii nauk SSSR, 1959, Vol 128, Nr 2, pp 312-315 (USSR)

ABSTRACT: It is difficult to produce organic substances with electrode
conductivity since the admitted zones, if they develop at all,
are narrow here, whereas the forbidden zones are very wide.
This width is so considerable that no electron excitation is
caused at temperatures at which the substance concerned is not
yet decomposed. The semiconductor properties of the substances
described in publications are usually connected with existing
condensed aromatic rings and nitrogen atoms (Ref 1). Current
carriers are bound to develop comparatively easily in polymers
with double bonds, especially with which have electrons on the
furthermore with atoms in the chain in the chemical bond (i.e.
enter levels that do not take part in the latter is
nitrogen atom). The electron dispersion in the latter is
bound to be low in the case of a sufficiently regular polymer

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structure. The necessary regularity degree can be approximately
estimated from the length of the free path of the electron in
the semiconductor, furthermore from the length of the C—C-bonds,
the length of the monomeric member, and the length of the
electron wave. It was found that one polymeric molecule is
sufficient in the main chain of which exists no branching with
more than 12 carbon atoms per 35 monomeric members. This holds
in the case of a fiber with medium elongation in which the
polymeric molecules are arranged in the direction of the
current. Then, no dispersion on the structural irregularities
is to be expected. The production of polymers with such a
degree of regularity is well possible today. An investigation
of the products of thermal transformation of polyacrylnitrile
is interesting from the above standpoint. The view of the
transformations proceeding here is explained by a scheme.
Table 1 gives the results of measurement of the paramagnetic
electron resonance of the polymers at room temperature. The
method and the device used for this purpose are described in
reference 3. From the data given in table 1 it follows that:
(1) the semiconductors obtained exhibit good electronic

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conductivity ($\Delta\epsilon<0$), (2) The concentration of current carriers
amounts to $10^{18} - 10^{19}$, the degeneration is therefore
inconsiderable, (3) The half-width of the spectra of the
paramagnetic electron resonance characteristic of the
relaxation duration amounts to 10-20 gauss. Figure 1 shows the
dependence of electrical conductivity on temperature for
polyacrylnitrile which was obtained by a redox initiation
and subjected to thermal transformation. The materials
produced on the basis of polyacrylnitrile have properties
typical of semiconductors, and may be used at increased
temperatures (Fig 1). The influence of a γ-radiation on the
polymer renders the subsequent thermal treatment still more
effective with respect to the production of semiconductors.
There are 1 figure, 2 tables, and 3 references, 3 of which are
Soviet.

SUBMITTED: July 16, 1959

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SOV/20-129-1-40/64

5(4)   5. 1190

AUTHORS: Kolbanovskiy, Yu. A., Kustanovich, I. M., Polak, L. S.,
Shcherbakova, A. S.

TITLE: Electron Paramagnetic Resonance Spectra for Some Catalysts of
Catalyst - Hydrocarbon Systems and the Action of γ-Rays on Them

ABSTRACT: The study of the electron paramagnetic resonance (epr) spectra
of catalysts and catalyst - hydrocarbon systems represents a
new method of investigating catalysts as well as chemosorptive
and catalytic processes. The authors used typical oxide catalysts,
such as are applied for cracking, dehydrogenation, hydrogena-
tion, desulfurization, etc. processes (aluminum oxide, aluminum
silicate, aluminum oxide-molybdenum oxide, $CoO.Al_2O_3.MoO_3$,
$Cr_2O_3.Al_2O_3$ activated by K_2O and molybdenum sulfide). The
spectra of the catalysts investigated are discussed (Figs 1-4).
The final results are summarized: Independent of irradiation
the adsorption of hydrocarbons on Al_2O_3- and aluminum silicate

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SOV/20-129-5-22/64

IUTHORS: Berezkin, V. G., Kustanovich, I. M., Polak, L. S., Topchiyev,
             A. V., Academician, Chernyak, N. Ya.

TITLE: Low-temperature Radiolysis of Hydrocarbons

PERIODICAL: Doklady Akademii nauk SSSR, 1959, Vol 129, Nr 5,
             pp 1042 - 1045 (USSR)

ABSTRACT: The authors investigated the influence exerted by low temper-
             atures and by the phase condition on the yield of various
             products of hydrocarbon radiolysis. The methods of prepara-
             tion and irradiation were described in reference 1. The com-
             position of the radiolysis products was determined by chro-
             matographic measurement. The concentration of the free radi-
             cals was measured by the instrument type EPR. The spectra
             were taken by the spectrograph type IKS-14 (infrared spectrum)
             and SF-4 (ultraviolet spectrum). Table 1 supplies data con-
             cerning hydrogen and methane yields from heptane, cyclo-
             hexane, and isooctane. It may be observed therefrom that the
             hydrogen yield drops by about 10-15% with heptane- and cyclo-
             hexane irradiation in the transition from room temperature to
             195°K. A further temperature drop has no noticeable effect

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(in agreement with Ref 3). The dependence of the H_2- and CH_4-yield from isooctane on the temperature is particularly striking. On the transition from room temperature to $195^\circ K$ the H_2-yield drops somewhat, but rises at $77^\circ K$. The amount of CH_4 drops markedly with dropping temperature. Atomic hydrogen effects the formation of H_2-molecules in two ways: $H+H \longrightarrow H_2$ (1), and $H+RH \longrightarrow R\cdot+H_2$ (2), in which connection reaction (2) requires a certain activation energy. Nonetheless, the major part of H_2 is bound to develop with reaction (2) at $300^\circ K$ due to the great difference in the concentrations of H and RH. Reaction (2) is rendered more difficult at $77^\circ K$. This would be expected to cause the yield of the H_2 part, which is formed by way of the radical, to drop by a maximum 50%. In reality, this decrease is 15% only. In the case of isooctane the H_2 yield even increases. Two causes may account for it: 1)Reaction (2) is not entirely suppressed, because the resulting atomic H may be "hot". 2) The lower yield of fragments from the burst of the C-C-bond may partially compensate the resulting H_2-yield. Any increase in the yield of fragment radicals is bound to effect a drop in the molecular hydrogen

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Low-temperature Radiolysis of Hydrocarbons

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SOV/20-129-5-22/64

yield and vice versa. This may be observed particularly well on isooctane. Not only the drop of the H_2-yield is compensated here but furthermore, this yield is increased at $77°K$, where the yield of fragment radicals is strongly reduced. Table 2 shows the yields of individual hydrocarbons from C_1 to C_5, which were obtained from heptane by radiolysis at 300, 195, and $77°K$. It may be seen therefrom that both the light saturated radiolysis products and the light unsaturated ones decrease somewhat on the transition from room temperature to $195°K$. Afterwards, their amount drops to 5/9. Table 3 shows the change in composition and amount of the unsaturated products. At all mentioned temperatures (dosage $\sim$ $2-4.10^{21}$ ev) trans-olefins, α-olefins and vinylidene structures are formed. The two olefins may be assumed to be brought on the basis of a molecular mechanism, as their formation is independent of temperature. The amount of vinylidene structures rapidly drops with temperature. This may be explained by a secondary character of their formation. Dienes are no doubt radiation-primary reaction products (Ref 4). Their yield is multiplied

Card 3/4   with temperature drop. Figure 2 shows the dependence of the

POLAK, L.S.

PHASE I BOOK EXPLOITATION   SOV/4984

International symposium on macromolecular chemistry. Moscow, 1960.

Mezhdunarodnyy simpozium po makromolekulyarnoy khimii SSSR, Moskva, 14-18 iyunya 1960 g.; doklady i avtoreferaty. Sektsiya III. (International Symposium on Macromolecular Chemistry Held in Moscow, June 14-18, 1960; Papers and Summaries) Section III. [Moscow, Izd-vo AN SSSR, 1960] 469 p. 55,000 copies printed.

Tech. Ed.: P. S. Kashina.

Sponsoring Agency: The International Union of Pure and Applied Chemistry. Commission on Macromolecular Chemistry.

PURPOSE: This book is intended for chemists interested in polymerization reactions and the synthesis of high molecular compounds.

COVERAGE: This is Section III of a multivolume work containing papers on macromolecular chemistry. The articles in general deal with the kinetics of polymerization reactions, the synthesis of special-purpose polymers, e.g., ion-exchange resins, semiconductor materials, etc., methods of catalyzing polymerization reactions, properties and chemical interactions of high molecular materials, and the effects of various factors on polymerization and the degradation of high molecular compounds. No personalities are mentioned. References given follow the articles.

PHASE I BOOK EXPLOITATION   SOV/5349

Polak, Lev Solomonovich

Variatsionnyye printsipy mekhaniki, ikh razvitiye i primeneniya v fizike
(Variational Principles in Mechanics, Their Development and Application
in Physics) Moscow, Fizmatgiz, 1960. 599 p. Errata slip inserted.
3,500 copies printed.

Eds.: A. T. Grigor'yan and S. A. Kamenetskiy; Tech. Ed.: N. A. Tumarkina.

PURPOSE: This book should be of interest to graduate students in physics,
university professors, and scientists interested in the role of variational
principles in the development of modern physics.

COVERAGE: The book, a limited edition of 3,500 copies, considers variational
_._ciples in mechanics and some of their applications in physics. A
.._..ew of the results obtained by scientists during the last three cen-
turies shows that the variational principles of mechanics which form the
basis of dynamics according to Hamilton - Jacobi are closely related to
the general theory of transformation groups, variational calculus, the
general theory of surfaces, and the general theory of differential equations.

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Variational Principles in Mechanics (Cont.)

SOV/5349

Among the principal topics treated are: the principle of least work from Fermat to Lagrange; Hamilton's optical-mechanical analogy and Hamilton - Ostrogradskiy's principle; the development of mathematical form and generalization of the variational principles of classical mechanics; and variational principles in mechanics and physics, in thermodynamic theory, in the classical and relativistic field theory, in Bohr's theory of the atom, in the development of quantum mechanics, and in the construction of the quantum field theory. Ch. VIII, which considers some problems in modern theoretical physics, was written jointly with A. M. Brodskiy. The author thanks the late A. N. Krylov and V. K. Frederiks, as well as Yu. A. Krutkov, Ya. L. Geronimus, B. N. Okuney, and members of the Department of Physics and Mathematics of the Institut istorii yestestvoznaniya i tekhniki (Institute of the History of Natural Sciences and Technology). A very large number of references (Soviet, French, English, German, Italian, and Latin) are contained in the text.

TABLE OF CONTENTS:

Preface

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POLAK, L.S.

Origin of Bose-Einstein quantum statistics. Iz ist. nauki i tekh.
v stran. Vost. no.1:315-329 '60.   (MIRA 14:8)
                        (Quantum statistics)

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B020/B061

81938

AUTHORS: Topchiyev, A. V., Paushkin, Ya. M., Kurashev, M. V.,
             Polak, L. S., Tverskaya, L. S.

TITLE: Polymerization of Cyclo-olefins

PERIODICAL: Izvestiya Akademii nauk SSSR. Otdeleniye khimicheskikh nauk,
             1960, No. 6, p. 1140

TEXT: In a short report, the polymerization reactions examined by the
authors (cyclohexene, cyclohexadiene-1,3, cyclohexadiene-1,4, 1-methyl-
cyclohexadiene-1,4, 1,2-dimethylcyclohexadiene-1,4, 1,4-dimethylcyclo-
hexadiene-1,4, and 1,5-dimethylcyclohexadiene-1,4) are characterized, and
their properties and the possibility of the use of the synthetized polymers
in various special fields are given. The polymerization of the above
hydrocarbons was carried out in different solvents, at various temperatures,
contact times, with the use of different catalysts, and under the action
of β - and γ-radiation. The polymers obtained with organo-metallic
catalysts, $TiCl_4$, and BF_3, as well as with β - and γ-radiation are listed,

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5 4100 (2209, 1043, also 1136, 1151)

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A051/A029

AUTHORS: Kargin, V.A., Academician, Topchiyev, A.V., Academician,
          Krentsel', B.A., Doctor of Chemical Sciences, Polak, L.S., Doctor
          of Physico-Mathematical Sciences, Davydov, B.E., Candidate of
          Chemical Sciences

TITLE: Semiconductor Properties of Polymer Materials

PERIODICAL: Zhurnal Vsesoyuznogo Khimicheskogo Obshchestva im. D.I. Mende-
             leyeva, 1960, No. 5, Vol. 5, pp. 507-514

TEXT: The authors deal with the problems of developing new classes of poly-
mers with certain predetermined electrophysical properties necessary for
industry, particularly semiconductivity. These problems have been one of
the main subjects of scientific research in the physics and chemistry of
polymers. An analysis of published works on the conductivity of low-mole-
cular organic compounds has shown that their semiconductivity properties are
connected with the π-electrons of the conjugated bonds in aliphatic chains

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Semiconductor Properties of Polymer Materials

or rings. "Metal-likeness" is said to be the result of a collection of the
π-electrons in a conjugated system, and from this stand-point the polymer
macromolecules with conjugated double bonds are of particular interest in
the production of materials having special electrophysical properties, in-
cluding that of semiconductivity. A list of available data is presented
on ordinary semiconductors comparing them to the structures and chemical
features of polymers. Semiconductors are characterized by the electrocon-
ductivity values of 10^{-8}-10 $ohm^{-1} \cdot cm^{-1}$, increasing with an increase in tem-
perature, and a concentration of the charge carriers of about 10^{10}-10^{21}
electrons or electronic "holes" in a cm^2. It is pointed out that deviations
from stoichiometry or any irregularity of the chain of the macromolecules'
main valencies can have the same effect as admixtures in polymers on their
semiconductivity properties. The distance between neighboring energy levels
being about 10^{-22} ev, the sum total of these is regarded as a compact band
about 1 ev wide and the energy value of the electron can be anywhere within
this range. This band of energy states is called a zone. For all solid

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bodies, i.e., metals, semiconductors and dielectrics, the lower zone of electronic levels is the wide, so-called valency zone of the electrons fastened to certain atoms. A difference is noted between the listed three types of solid bodies when there is a shift to a higher energy level. Semiconductors having no additional levels in the forbidden zone are called semiconductors with self-conductivity. In the presence of an electrical field the free electrons and "holes" are the charge carriers. It is pointed out that real bodies always contain admixtures, creating admixture levels in the forbidden zone of the semiconductor located either closer to the upper or lower zone, in both cases causing the occurrence of additional admixture conductivity. The admixtures are called donor type in the first case and acceptor type in the second. It is assumed that any irregularity of the macromolecules usually creates acceptor admixtures. The mobility of the charge carriers is said to depend on the temperature and concentration of the admixtures and to decrease with an increase in the temperature and amount of admixture. Special interest is shown in the semiconductor type discovered by de Boer (Ref. 3), where part of the atoms of the lattice is replaced by atoms with almost the same size but a difference in valency. Tne method by which they are produced was developed for oxide semiconductors,

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Semiconductor Properties of Polymer Materials

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and consists in adding metals to the sample having a valency differing by a
unit of 1 from the valency of the main metal. It is thought possible to
form new synthetic polymers having semiconductor properties by a similar meth-
od of introducing metals into the chain of the macromolecule. Ordinary
polymers have a certain amount of electroconductivity (Ref. 4,5), which de-
pends on the temperature, and is expressed by $\sigma \sim \exp -\frac{E}{kT}$, where E is a
certain activation energy, T the absolute temperature, k Boltzmann's con-
stant. From this relationship the authors have attempted to solve the
problem of establishing the connection between the polymer's structure and
its electrophysical or electroconductivity properties. In solving this
problem they based their analysis on the known aspects of the electroconduc-
tivity of low-molecular (including organic) compounds. This was followed
by the determination of the characteristic features of the polymer struc-
ture. The problem of electroconductivity in organic polymers was divided
into two parts: 1) the movement of electrons in the macromolecule, 2) trans-
fer of electrons (or holes) from molecule to molecule. In the first part,
an isolated linear macromolecule with the same bonds is analyzed:

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Semiconductor Properties of Polymer Materials   S/063/60/005/005/003/021
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$$\cdots - \underset{H}{\overset{H}{\underset{|}{\overset{|}{C}}}} - \underset{H}{\overset{H}{\underset{|}{\overset{|}{C}}}} - \underset{H}{\overset{H}{\underset{|}{\overset{|}{C}}}} - \underset{H}{\overset{H}{\underset{|}{\overset{|}{C}}}} - \underset{H}{\overset{H}{\underset{|}{\overset{|}{C}}}} - \underset{H}{\overset{H}{\underset{|}{\overset{|}{C}}}} - \cdots$$. The exact path followed by the potential of

the electrical field formed by the electrons and nuclei of this type of sys-
tem is not known, but the field changes periodically in space, and its peri-
od is determined by the periodicity of the molecular chain structure. An
electron is theoretically placed into this field and its movement is regard-
ed through the Schroedinger equation for an electron in a periodic field,
the solution of which in this case is said to be the wave functions accord-

ing to Block (Ref. 6): $\Psi = \mathscr{S}_{\eta} e^{i-h-x}$, where $\mathscr{S}_{\eta}(x)$ is a function depending
on the wave number η, and is periodic relative to x; the magnitude of the
period is determined by the structure of the molecule: by the length of the
interatomic bonds, etc. This solution causes a zonal structure (Ref. 4,5).
In calculating these fields the authors state that the theory of disturbance
of quantum mechanics is used analyzing two extreme cases: a) a strong bond,
b) a weak bond. It is pointed out that a real macromolecule can have con-
ductivity if there are electrons in it whith sufficient probability of shift
under the effect of an external electrical field with its component along

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                                                    A051/A029

the molecular chain. The authors draw the conclusion that the probable nec-
essary condition for the existence of electroconductivity in a macromole-
cule is the presence of multiple, particularly double bonds. It is con-
sidered advantageous to have a maximum number of multiple bonds, which can
be accomplished in linear molecules and organic rings by alternating the
single and double bonds (polyconjugation). The presence of a maximum number
of multiple conjugated bonds in the macromolecule with a comparatively weak
bond of the electrons to the atoms would facilitate the increase in electro-
conductivity. It is considered expedient to introduce atoms with a rela-
tively weak bond of the electrons on the outer orbits, in order to decrease
the width of the forbidden zone. The conductivity is further dependent on
the migration of the double bonds and thus it is also expedient to increase
the number of possible migrations of this kind, forming comple cyclic struc-
tures of conjugated bonds, (e.g., phthalocyanine and the metal compound type).
In a molecule having quasi-free electrons the possibility of electronic and
hole-type conductivity is present. The authors attempt to give a rough eva-
luation of the cases: Thus in the case of a double bond the π-electrons
are less firmly attached to the corresponding atoms or group of atoms than

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the $\mathcal{E}$-electrons and more mobile, and thanks to the quantum tunnel effect can overcome the barrier $U(r)$ and mov, to a neighboring bond with a probability p (relative to a unit of time)

$$\frac{1}{\tau} \sim p \approx \frac{V}{L} \exp\left\{ -\frac{2}{-h-} \int_{r_1}^{r_2} \sqrt{2m[U(r) - \mathcal{E}]}\, dr \right\}$$ (A), where τ is the life-span of

the electron on a separate bond, $-h- = \frac{h}{2\pi}$, L is the width of the potential depression, where the electrons are located, m is the electron mass, V is its velocity, $\mathcal{E}$ is the kinetic energy. The complex function $U(r)$ is replaced for simplicity by a rectangular potential barrier (Fig. 1), then L is determined by the length of the double bond C=C, U_0 is determined by the dimensions of the atom C, $U_0 - \mathcal{E}$ by the potential energy of the most weakly bonded electron. Then equation (A) becomes:

$$\tau \approx \frac{1}{V} \exp\left\{ -\frac{2}{-h-} L_0 \sqrt{2m(U_0 - \mathcal{E})} \right\}.$$ At $L = T \cdot 10^{-8}$, $U_0 - \mathcal{E} = 10$ ev $= 10^{-8}$ cm/sec,

we obtain $\tau = 10^{-15}$ sec. Thus during the time of the electron being locat-

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ed on one bond about 10^{-15} it shifts over at a rate of $V_{shift} = \frac{0^{-8}}{0^{-15}} = 10^{7}$ cm/
sec. The given formulas show that due to the strong dependence of τ on U
and $U_{max.} - \mathcal{E}$, the electrons of the internal orbits forming the polymer mole-
cule, which have a greater bond energy, will be almost completely local-
ized and will not be able to participate in the electroconductivity of the
macromolecule. It is stressed that the problem of the transfer of the charge
carriers (electrons and holes) from molecule to molecule is a difficult one.
It is assumed that the mobility of the charge carriers can be mainly deter-
mined by the probability of the tunnel gap through the intramolecular bar-
rier and that high temperatures are necessary so that the electrons can over-
come these gaps between the macromolecules. The electroconductivity of the
polymer semiconductor will depend only on the concentration of the charge
carriers in the first approximation (at a given structure of the polymer).
The importance of the intramolecular transfers is stressed on the example of
the benzene molecule, which is an excellent conductor, but liquid benzene
(a group of these molecules) is an excellent insulator. The actual potential
barrier between the macromolecules depends on these conditions, i.e., on the
distance between the macromolecules and their number in a unit volume. The

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chemical bonds between the molecules and their space orientation will also
become relevant factors in future. The optimum conditions for the formation
and movement of charge carriers in the macromolecule is partly determined by
the formation of the polymer molecule with polyconjugated and aromatic rings
in the chain, but the latter do not solve completely the problems of easing
the intramolecular barrier for them. Further mention is made of the signi-
ficant effect of orientation on the electroconductivity of the polymer. The
orientation of the polymer molecule also causes severe anisotropy of its prop-
erties along and across the axis of orientation. As regards the electrocon-
ductivity, it is assumed that the orientation can lead to two results: an increase
in the number of charge carriers passing in a unit of time through a certain
transverse cross-section of the polymer semiconductor, and the occurrence of
severe anisotropy of the conductivity. In a polymer with regularly-built
chains the conductivity is present only in the chain molecules. It is sug-
gested that the conducting elements can be simply arranged parallel to each
other, and thus create a system with good conductivity along the orienta-
tion axis and a slight conductivity in the perpendicular direction. The most
expedient conditions are a high degree of regularity and few transverse bonds,
since the latter would form the most perfected orientation of the polymer
thread. This type of polymer system should have the best conductivity along
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the orientation axis and the highest anisotropy of the conductivity. The authors discuss the paramagnetic properties of semiconductors, particularly occurring in their spectra of electronic paramagnetic resonance (EPR). Since the integral EPR spectrum is connected with the number of electrons present having non-paired spins in the investigated system, it is assumed that the π-cloud is characterized by a certain non-pairing. The number of particles with non-paired spins corresponding to the narrow signal in the EPR spectrum of the polymer is about $10^{18}-10^{19}$ in one cm^3. But these cannot be considered charge carriers in polymers with semiconductor properties for the following reason: the electroconductivity increases with the temperature and the concentration of these particles determined by the area of the narrow line mentioned in the EPR spectrum drops. It is assumed that the second wide signal might be connected with the electroconductivity. The EPR spectrum is considered a property of the modecule and not of the polymer on the whole. The signal in the EPR spectrum indicates the fulfillment of an important, although not the only, condition for the polymer (especially synthesized or processed), to possess semiconductor properties. The presence of a system of conjugated double bonds is considered important but not adequate for the formation of a polymer material, which would completely be conducting, particu-

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larly semiconducting. The authors claim that it is possible to produce polymers with a system of conjugated bonds in the main chain in two ways: 1) by transformation of the macromolecules in the chain of already known polymers, 2) by special construction (synthesis) of the macromolecules with a system of conjugated bonds. Some of the specific work done on the synthesizing of polymer molecules with a system of conjugated bonds is gone into, particularly that of the products of thermal transformation of polyacrylonitrile. It is thought that interesting prospects lie in the production of this polymer substance characterized by a complex of electrophysical properties, viz., semiconductivity. It is assumed that in the thermal transformation the polyacrylonitrile undergoes chemical changes leading to the formation of a polymer, the macromolecules of which consist of cyclic chains. The given reaction schemes show that in this type of polymer semiconductivity properties can be expected. This corresponds to the theory developed by Semenov (Ref. 7) in analyzing the EPR spectra of certain polymer molecules, especially that of polyaminoquinone. When elevating the temperature of processing the polyacrylonitrile, the narrow signal of the EPR mentioned above increases (Fig. 3) almostly linearly in the temperature range of 325-600°C. Similar data were previously obtained in the thermal processing of polyvinylchloride (Ref. 10). The authors feel partially justified in assuming that in order to produce
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satisfactory semiconductor properties, a strict regularity of the structure
of the polymer chains is needed. It is also assumed that polyacrylonitrile
forms such regular chains. Special interest is felt in orientation as a
means for increasing the regularity of the structure of polymers amongst
other possibilities. The authors specify that at the present time several
new polymer materials, the macromolecules of which have a system of conju-
gated double bonds, have been produced both in the USSR and abroad. These
polymers have interesting magnetic properties. In this connection the work
of Berlin (Ref. 15) is noted in the synthesis of polyaminoquinones. In the
interaction of chloranil with benzidine polymers were obtained of the given
structure. The authors of this synthesis assume that in this case there
are not only intermolecular hydrogen bonds, but also bonds of the intrachain
type, which can lead to spatial structuralizing and impairment of the solub-
ility. Reference is also made to polymer-chelate complexes of percyanoethy-
lene with metals (Ref. 21) stating that these compounds have a high thermal
stability, a high magnetic susceptibility, a low activation energy, (0.26)
and σ about 10^{-2} ohm^{-1}·cm^{-1} at 20°C. Special attention is further paid to
the products synthesized by the authors (Ref. 16) of semi-condensation of
phthalic anhydride with n-phenylenediamine and hydroquinone. The latter are

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characterized by an electroconductivity of $7 \cdot 10^{-7} ohm^{-1} \cdot cm^{-1}$ with an activation energy of about 0.6 ev. Roginskiy (Ref. 18) mentioned the interesting possibilities of using the semiconducting properties of certain organic polymers as heterogenic catalysts. Semenev (Ref. 20) studied this matter further. In conclusion the authors point out that the future profound investigation of the properties of polymer materials with a system of conjugated bonds, especially those with obvious semiconducting properties, will lead to new possibilities of creating heterogeneous catalysts with a high selectivity. There are 2 figures, 1 table, 5 structural formulae, 1 diagram, 3 equations and 21 references: 14 are Soviet, 6 English, 1 Belgian.

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S/020/60/135/002/026/036
B004/B056

AUTHORS: Kolbanovskiy, Yu. A. and Polak, L. S.

TITLE: Kinetic Equations of Radiochemical Monomolecular Reactions
not Taking a Chainlike Course

PERIODICAL: Doklady Akademii nauk SSSR, 1960, Vol. 135, No. 2,
pp. 361-364

TEXT: In the introduction, the authors note that for many reactions, which
are of importance in practice, such as inhibited radiolysis of hydrocarbons,
radiolysis at large integral doses, neither general nor special kinetic
equations exist. Therefore, they set themselves the task of deriving
equations for various not chain-like monomolecular radiochemical processes
of a substance X. They assume that X has two kinds of excited states,
$X^*_{(1)}$ and $X^*_{(2)}$, and an arbitrary number m of modes of decomposition. The
authors studied: A) the range of small integral doses (consumption of X
and inhibiting action of the final products are negligibly small). The

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Kinetic Equations of Radiochemical
Monomolecular Reactions not Taking a
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following is written down: 1) $X_M \rightarrow X^*$; excitation by radiation: $W_1 = K_1 I$ (1)
(I - differential doserate in $ev/cm^3 \cdot sec$). 2) $X^* \rightarrow X$ (+ $h\nu$), dissipation
and radiation: $W_2 = K_2[X^*]$ (2). 3) $X^* \rightarrow$ products of decomposition (m -
modes of decomposition or isomerization): $W_3 = \sum_{i=3}^{m} K_i[X^*]$ (3). For two

excited states one finds: $W_3 = I[K_{(1)1}\overline{K}_{(1)3}/(K_{(1)2}+\overline{K}_{(1)3}) + K_{(2)1}\overline{K}_{(2)3}/K_{(2)2}$
$+ \overline{K}_{(2)3})]$ (7). B) The kinetics of the radiochemical reaction with
small inhibitory admixtures which act as "catchers" and thus as protectors.
4) $X^* + B \rightarrow X + B^*$ (B = inhibitor): $W_4 = K_4[X^*][B]^{n/3}$ (9)"; $n \leqslant 3$ is an
integer. C) Radiochemical processes at the mean integral dose and with an
accumulation of excitation acceptors A in the reaction products. On the
assumption that A is formed from $X^*_{(2)}$ and inhibits the decomposition of
$X^*_{(1)}$, one obtains: $W_{(2)3} = \overline{K}_{(2)3}[X^*_{(2)}] = d[A]/dt$ (10), and in consideration

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of the process 5): $X^*_{(1)} + A \longrightarrow A^* + X$, W_3 becomes equal to

$$W_3 = I[X]\left[\overline{K}_{(2)} + 1/(\overline{K}_{(1)} + \overline{K}_A[A]^{n/3})\right]$$ (16). D) The kinetics of radio-
chemical reactions inhibited by small admixtures of a substance, the
protective effect of which is based upon its consumption: $X^*_{(1)} + D \longrightarrow X + D^*$.
An equation analogous to equation (16) is obtained in which $[A]$ is
substituted by $[D]$. Whereas $[A]$ increased with an increase in the dose,
$[D]$ decreases in the course of irradiation. For the case in which the
decomposition probability for D^* is not equal to one: 7) $D^* \longrightarrow D$; $W_7 = K_7[D^*]$
and 8) $W_8 = K_8[D^*]$, the value of K_D is influenced by the ratio K_8/K_7
without the form of the equation being changed. E) Kinetics of the
monomolecular radiochemical reaction with an addition of the substance X
to a medium M which transfers the radiation energy to X. Additional
processes occur: 9) $M \longrightarrow M^*$; $W_9 = K_9 I$, 10) $M^* \longrightarrow M$; $W_{10} = K_{10}[M^*]$;

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11) $M^* + X \longrightarrow M + X^*$; $W_{11} = K_{11}[M^*][X]^{n/3}$, and one obtains:

$W_s = K_3[X^*] = K_1 K_3 I[X]/(K_2 + K_3) + K_3 K_9 K_{11} I[X]^{n/3}/[(K_2 + K_3)(K_{10}+K_{11}[X]^{n/3})]$
(22). For $K_2 = 0$, $n = 3$, this equation is identical with that derived by
V. A. Krongauz and Kh. S. Bagdasar'yan for the radiolysis of benzoyl
peroxide in benzene (Ref. 3). As the relations set up by the authors are
valid for all principal kinds of monomolecular, not chain-like
radiochemical processes, special experiments may be carried out to study
the kinetic parameters. There are 3 references: 1 Soviet and 2 US.

ASSOCIATION: Institut neftekhimicheskogo sinteza Akademii nauk SSSR
(Institute of Petrochemical Synthesis of the Academy of
Sciences USSR)

PRESENTED: June 3, 1960 by A. V. Topchiyev, Academician

SUBMITTED: June 3, 1960

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POLAK, L.S.

To be submitted for the International Symposium on Macromolecular Chemistry, Montreal, Canada, 27 Jul -1 Aug 1961.

USSR

KARGIN, V. A., Institute of High Molecular Chemistry, Academy of Sciences USSR, Leningrad, jointly with KHURGIN, W. R., and KABAN, K., Duke University, Durham, N.C. - "Elasticity of cube lattice chain networks" (Group 2)

KOZLOV, Boris A., and KARGIN, A. V., Institute of Fine Chemical Technology imeni M. V. Lomonosov - "Interaction of polyethylene with sulphur" (Group 1-5)

KARGIN, Valentin A., Head, Laboratory of Colloidal Chemistry, Scientific Research Physico-Chemical Institute imeni L. Ya. Karpov, Moscow - "The formation of big crystal structures in polymers and their properties" (Group 2, Invited Lecture)

KARGIN, V. A., KABANOV, A. V., and BAKEYEV, N., Institute of Petroleum, Academy of Sciences USSR, Moscow - "Polymerization of some epoxy compounds" (Group 1-5)

KORSHAK, Sergey S., SPIRIN, Yu. L., KLIMOV, A., AKER-KHUDOVICH, Scientific Research Physico-Chemical Institute imeni L. Ya. Karpov, Moscow - "Polymerization catalyzed by lithium and lithium alkyl" (in German) (Group 3-B)

KORSHAK, N. S., TOLSTOY, A. V., and POLAK, L. S., Institute of Petrochemical Synthesis, Academy of Sciences USSR, Moscow - "On the catalytic polymerization and radiochemistry of ethylene" (Group 3-A)

KOROTKOV, A. A., All-Union Scientific Research Institute of Synthetic Rubber imeni S. V. Lebedev, Leningrad - "Temperature effect on polymer structure in diene polymerization by alkali metals" (Group 3-B)

KORSHAK, V. V., and KRONGAUZ, Ye. N., VIG, Scientific Research Institute of Synthetic Rubber, Leningrad - "Study of branching in regular isoprene polymers" (Group 1)

KORSHAK, V. V., MEDVEDEV, S. S., Physico-Chemical Institute imeni L. Ya. Karpov, Moscow - "Investigation of the mechanics of radiolysis of polymers containing quaternary atoms of carbon (Group 1-5) P.............V.H.

KUVSHIN, Viktor M., Institute of High Molecular Compounds of the Academy of Sciences USSR, Leningrad - "Stereo-regularity and optical anisotropy of macromolecules" (Group not specified)

KURANOV, Buroko M., and SUSHKEVICH, T. I., Academy of Sciences USSR, Tashkent, Uzbekistan - "The investigation of the cotton cellulose polydispersity according to the molecular weight" (Group not specified)

KURANOV, N. S., Institute of Chemical Physics of the Academy of Sciences USSR, Moscow - "On the kinetics of formaldehyde polymerization and polyformaldehyde degradation" (Group 3-B)

POLAK, L. S.

33103
S/638/61/001/000/028/056
B116/B102

5.4600   1274

AUTHORS: Kolbanovskiy, Yu. A., Kustanovich, I. M., Polak, L. S.,
Shcherbakova, A. S.

TITLE: Effect of gamma radiation on oxide catalysts and on systems
consisting of a catalyst and adsorbed hydrocarbon

SOURCE: Tashkentskaya konferentsiya po mirnomy ispol'zovaniyu
atomnoy energii. Tashkent, 1959. Trudy. v. 1. Tashkent,
1961, 191-192

TEXT: The authors studied the epr spectra of a series of catalysts
before and after irradiation with ~1.25-Mev Co^{60} γ-quanta. They
attempted to find out whether carriers of unpaired-electrons exist in the
polycrystalline samples. They also studied the interaction between
hydrocarbon (and/or the radiolysis product) and the catalyst during
adsorption. For this purpose they used aluminum oxide, aluminum silicate
cracking catalyst, potassium oxide-promoted chromo-alumina catalyst two
molybdeno-alumina catalysts, molybdenum disulfide and cobalto-molybdeno
alumina catalysts. None of the catalysts except $Cr_2O_3Al_2O_3$ released a

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signal in the epr spectrum prior to irradiation. The sensitivity of the
instrument was approximately 10^{16} unpaired spins in the working volume of
the ampoule. After irradiation at $20^{\circ}C$ all catalysts with aluminum
oxide content released a distinct signal. Its position and width
correspond to that of the aluminum oxide signal. A sufficient amount of
adsorbed water is probably the reason of the activation of Al_2O_3 catalysts
due to irradiation. The adsorption of hydrocarbons (n-heptane, n-heptene-
1, cyclohexane and benzene) at $20^{\circ}C$ does not change the resonance spectra.
At $-196^{\circ}C$ heptane adsorption on molybdenum sulfide caused two high peaks
in the resonance spectrum at both sides of $g-2.0033$. At $-196^{\circ}C$ this
phenomenon was observed in all hydrocarbons. Irradiation of a system
consisting of a catalyst and adsorbed hydrocarbon not only release the
aluminum oxide signal but also a more intense signal with $g < 2$. This
indicates an electronic interaction between the hydrocarbons that had been
subject to radiolysis in adsorbed state and the surface of the mentioned
catalysts which contained metal oxides of variable valence. There is
1 non-Soviet reference. The reference to the English-language publication
reads as follows: J. Phys. Chem., 63, 500, 1959.

ASSOCIATION: Institut neftekhimicheskogo sinteza AN SSSR (Institute of
Card 2/2   Petrochemical Synthesis AS USSR)

38624
S/081/62/000/009/019/075
B158/B101

5.4600

AUTHORS: · Topchiyev, A. V., Polak, L. S., Chernyak, N. Ya.,
Glushnev, V. Ye., Glazunov, P. Ya., Vereshchinskiy, I. V.,
Syrkus, N. P., Breger, A. Kh., Vaynshteyn, B. I.

TITLE: Radiation-heat cracking of hydrocarbons

TEXT: The low overall yield of radiolysis products from hydrocarbons at
room temperature points to the absence of a chain reaction at that tem-
perature. To examine the possibilities of a chain reaction in radiation
cracking, n-heptane was irradiated by Co^{60} γ-rays at high temperatures.
The samples were irradiated in 15 ml bulbs made of molybdenum glass with
a wall thickness of ∿1 mm. The amount of liquid heptane was 0.25 ml and
the pressure in the ampoules on vaporization 2.5 T/273 atm. To prevent
local preheating of the walls, the bulb was rotated twice a second. The

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Radiation-heat cracking of hydrocarbons

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radiation dose output calculated on 1 ml of liquid n-heptane was $2 \cdot 10^{13}$ Mev/sec. It is shown that radiation-heat cracking of n-heptane occurs at considerably lower temperatures than purely thermal cracking which needs a temperature of $\sim 500^{\circ}C$. The yield of liquid unsaturated hydrocarbons from radiation-heat cracking increases from 1.8 at room temperature to 340 at $450^{\circ}C$. The total radiation-chemical yield of low molecular hydro-carbons is 2000 at $400^{\circ}C$, being therefore $\sim 10^{3}$ times as great compared with the radiation-chemical yield of the same products at 20°C. By combining the radiation effect with temperature it is possible to obtain products which offer industrial interest at levels of yield which would be acceptable in practice. Possible sources of radiation for radiation-heat cracking are considered. [Abstracter's note: Complete translation.]

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S/169/61/000/011/028/065
D228/D304

AUTHORS: Polak, L.S., Filippov, Ye.M., Kuznetsov, G.A., and
             Zhavoronkov, V.Ya.

TITLE: Investigating the spectrum of dispersed gamma-radia-
             tion in conformity with the solution of certain geo-
             physical problems

PERIODICAL: Referativnyy zhurnal, Geofizika, no. 11, 1961, 34-35,
             abstract 11A306 (Geologiya i geofizika, no. 3, 1961,
             111 - 115)

TEXT: Experiments are described on the study of the spectrum of
dispersed γ-radiation; these were carried out with the aim of cla-
rifying the possibilities of the method of dispersed γ-radiation
(DGR). The isotopes Co60 and Cs137 were used. A luminescent counter
with a crystal of CsI (Tl) and a ФЭУ-29 (FEU-29) photomultiplier
were employed as an indicator. A 100-channel analyzer of the "Radu-
ga" type was used. The source and indicator of the radiation were
placed in a lead shield at a distance of 7 cm from each other. The
depth-potential of the investigation was ascertained in plexiglass,

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Investigating the spectrum of ...   S/169/61/000/011/028/065
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glass and iron. The spectra obtained in these media are given. It
was established that the increase in the density of the medium and
in its effective atomic number leads to the decrease in the depth-
potential of the investigation. The increase in the energy of the
source of the γ-quanta from 0.661 m.e.v. to 1.25 m.e.v. for a 7 cm
probe results in practically no change in the depth-potential of
the investigation. The recording of the maximum of the equilibrium
spectrum of the dispersed γ-radiation in place of the recording of
the integral rate of counting is recommended when working with a
7 cm probe; this leads on an average to a 25 % increase in the depth
-potential. The dependence of the measurement results on the change
in the rock density in the interval 0.4 - 7.8 g/cm^3 was investiga-
ted. It was established that the increase in the energy of the sour-
ce of the γ-quanta results in the increase sensitivity of the me-
thod to changes in the rock density. It is shown that the presence
of small impurities of the heavy element (Pb) in the sand leads to
the sharp change in the spectrum of the dispersed γ-radiation, and
that the method's sensitivity to the content of the heavy element
in the K-jump region is higher compared with the integral. In the
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31669
S/607/61/003/000/002/002
E075/E185

AUTHORS: Topchiyev, A.V., Lavrovskiy, K.P., Polak, L.S.,
            Brodskiy, A.M., and Kolbanovskiy, Yu.A.

TITLE: Investigation into the radiation chemistry of
            petroleum hydrocarbons and the application of nuclear
            irradiation in the petroleum refining industry and
            petrochemical synthesis

SOURCE: International Petroleum Congress. 5th, New York, 1959
            [Doklady] t. 3: Pererabotka nefti i gaza.
            Neftekhimiya. Moscow, Gostoptekhizdat, 1961. 345-354.

TEXT: Liquid alkanes, mainly n-heptane, were subjected to
X-ray radiolysis. It was found that at room temperature the amount
of hydrogen, molecular weight and refractive index of the liquid
phase increase linearly with the irradiation. The amount of
methane increases depending on the proportion of CH_3 groups in the
molecule. UV spectra indicate the formation of polymers with
conjugated double bonds. The number of such bonds increases with
the number of CH_2 groups in the alkane molecules. It was shown
that the weight percent of the heavy residue increases
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Investigation into the radiation ...   S/607/61/003/000/002/002
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proportionally with the increasing doses of radiation.   The
molecular weight of the residue ranges from 175 to 218 and
specific gravity 0.76 to 0.80 g/cm^3.   The radiolysis of n-heptane
at -196 °C (in liquid nitrogen) gave products containing a marked
proportion of free radicals as demonstrated by the examination of
their paramagnetic spectra.   At this low temperature free atoms
of hydrogen are present for a considerable time, which opens new
perspectives before petrochemical industry.   The yield of the
products of the recombination of C_7H_{15} radicals at the low
temperatures (giving various isomers of tetradecane) is halved
compared with the yield obtained at 20 °C.   The yield of the
products obtainable by monomolecular reactions as well as the
probability of transmission of the activation energy to other
molecules decreases with temperature.   In the case of catone
UV absorption on irradiation at -79° and -196 °C is 4 times higher
than that of catone treated at room temperature which indicated a
rapid increase in the formation of dienes.   The formation of
polymers is slower.   For the small doses of radiation a direct
proportionality between the yields of gases and time of
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Investigation into the radiation ... S/607/61/003/000/002/002
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irradiation was observed. The addition of dibenzylsulphide to the
alkanes prevented their radiolysis to a large extent. In the
gaseous products of the radiolysis of the solution there is no H_2S,
which suggests that a transmission of activation takes place.
It was found that an important role during the irradiation of the
alkanes is played by the process of direct rupture of carbon-
carbon bond leading to the formation of alkyl radicals and final
products (odd- and even-numbered carbon hydrocarbons). A study of
the radiation and thermal stability of aromatic hydrocarbons was
conducted by subjecting them to nuclear reactor irradiation at high
temperatures. At the same time the thermal stability was
controlled at 400 °C. It was shown that the thermal stability at
400 °C and radiation stability at 330 °C and irradiation dose of
1500 microrads are approximately the same. The introduction of
methyl groups into the aromatic system leads to a marked decrease
in the radiation stability. An increase of irradiation temperature
from 220 to 330 °C accelerates the decomposition.

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Investigation into the radiation ...   S/607/61/003/000/002/002
                                          E075/E185

There are 6 figures, 5 tables and 7 references: 5 Soviet-bloc
and 2 non-Soviet-bloc.   The English language references read as
follows:
Ref.6: G.A. Freund. Nucleon, v.14, no.8, 62, 1956;
        L.W. Fromm, K. Anderson. Nucl. Sci. Eng., 2(1), 160, 1956;
        Colichman, E.L., Fish, R.F. Nucleon, v.15, no.2, 72, 1957;
   E.L. Colichman, R.H. Gercke. Nucleon, v.14, no.7, 50, 1956.

Ref.7: R.O. Bolt, S.G. Caroll. Proceedings of the International
        Conference on Peaceful Uses of Atomic Energy, Geneva, v.7,
        8-20, 1955. United Nations, c. 550. N.Y., 1956.

Card 4/4

S/065/61/000/004/002/011
E030/E235

AUTHORS: Berezkin, V. G. and Polak, L. S.

TITLE: Chromatography of C_5-C_7 Hydrocarbons Over the
Surface Active Substance ОП-7 (OP-7)

PERIODICAL: Khimiya i tekhnologiya topliv i masel, 1961, No. 4,
pp. 14-18

TEXT: The effectiveness of OP-7 as a stationary liquid
phase in chromatography of hydrocarbons has been studied experimen-
tally. The structure of OP-7 is:

$O(CH_2CH_2O)_n-CH_2CH_2OH$

R

$O-(CH_2CH_2O)_n-CH_2CH_2OH$

—R

R
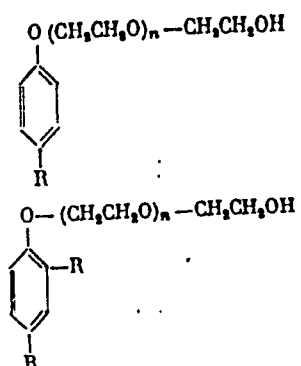
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Chromatography of C_5-C_7 Hydrocarbons Over the Surface Active
Substance OP-7

OP-7 was selected because it is a readily available compound and, being surface active, should possess the chromatographic separation advantages of detergents, without the disadvantage of being ionic and hence requiring hermetically dry conditions. R is an alkyl group containing 9-10 carbon atoms, and n is about 6-7. The functional groups of each molecule include ethers, alcohols, and hydrocarbons, and should therefore confer great selectivity on separation of organic materials. The chromatograph was of the usual type, with diatomaceous earth as the inert phase, and a thermal conductivity detector coupled to a 10 mV 2.5 second response time recorder. The volume of the probe chamber was 0.5 mm, and the minimum quantity of material which could be analyzed was 1.10^{-3} ml, using helium as carrier gas. For a 10-15 component mixture 0.2 to 0.5 ml gas would be preferable for high sensitivity. The chamber could be heated to 150°C. A complete analysis lasted no longer than 40 minutes. The optimum gas velocity to give the greatest number of theoretical plates was determined to be 2.4 ml/sec. Residence times varied from 0.06 sec (C_2) to 10.02 sec.
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E030/E235

Chromatography of C_5-C_7 Hydrocarbons Over the Surface Active
Substance OP-7

(1-pentane) over the C_2 to C_7 range. C_5 mixtures are completely
resolved. C_6 and C_7 are resolved with the exception of 2,3-
dimethylbutane, and 2-methylpentane. C_3 and C_4 are resolved
completely, but C_2 requires passing through a subsequent column
containing silver nitrate solution on diatomaceous earth in the
ratio 2:10. Using this technique, the separating efficiencies of
other liquids could be compared, and n-hexatriacontane and
benzyldiphenyl were tried. An activity coefficient $\gamma_{2,1}$ was
defined as:

$$\gamma_{2,1} = \frac{1}{\alpha_{2,1}} \cdot \frac{P_1^\circ}{P_2^\circ} \, ,$$

where $\alpha_{2,1}$ was the degree of separation and P's are partial
pressures of the substances being separated. On this ranking,
separation of paraffin isomers was ranked as best for n-hexatria-
contane($\gamma_{2,1}$ = 0.95-0.91), then benzyldiphenyl ($\gamma_{2,1}$ = 0.69-0.68),
and OP-7 ($\gamma_{2,1}$ = 0.59-0.54). There are 2 tables, 2 figures and

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Chromatography of C_5-C_7 Hydrocarbons Over the Surface Active Substance OP-7

16 references: 8 Soviet and 8 non-Soviet.

ASSOCIATION: In-t neftekhimicheskogo sinteza AN SSSR
(Institute of Petrochemical Synthesis AS USSR)

Card 4/4

POLAK, L.S.; FILIPPOV, Ye.M.; KUZNETSOV, G.A.

Effect of hidden contacts and interstices on research by gamma-ray scattering. Geol.i geofiz. no.5:82-87 '61.   (MIRA 14:6)

1. Institut geologii i geofiziki Sibirskogo otdeleniya AN SSSR, Novosibirsk i Institut neftekhimicheskogo sinteza AN SSSR, Moskva.
(Rocks—Analysis) (Gamma rays—Industrial applications)

S/169/61/000/011/001/065
D228/D304

AUTHORS: Polak, L.S., and Rapoport, M.B.

TITLE: The relation of the velocity of elastic longitudinal waves to certain physical properties of sedimentary rocks

PERIODICAL: Referativnyy zhurnal, Geofizika, no. 11, 1961, 6, abstract 11A55 (V sb. Prikl. geofizika, no. 29, M., 1961, 12 - 19)

TEXT: The results are described for studying the velocities of longitudinal waves in specimens of sedimentary rocks for boreholes on the South Emba uplift and the Mangyshlak peninsula by the ultra-sonic impulse method. On the whole the data of the velocity measurements coincided with the results of the recoil coefficient determinations; the presence of the relation of the velocity characteristics to the porosity, density, and electric resistance was confirmed. However, the study of the influence of dampness on the velocity in sandstone specimens led to new conclusions. The complex cha-

Card 1/2

TOPCHIYEV, A.V.; KOLBANOVSKIY, Yu.A.; POLAK, L.S.; KHAIT, Yu.L.;
        SHLIKHTER, E.B.

    Radiolysis of alkanes adsorbed on semiconductor catalysts.
    Neftekhimiia 1 no.1:105-116 Ja-F '61.   (MIRA 15:2)

    1. Institut neftekhimicheskogo sinteza AN SSSR.
            (Paraffins) (Radiation) (Catalysts)

33590

S/204/61/001/005/008/008
E075/E484

5.4600
11.1210

AUTHORS: Polak, L.S., Chernyak, N.Ya., Shakhray, V.A.,
Shcherbakova, A.S.

TITLE: γ-radiolysis of n-hexane in the presence of small
admixtures of benzene

PERIODICAL: Neftekhimiya, v.1, no.5, 1961, 695-699

TEXT: The authors investigated the composition of the main
products of radiolysis of hexane in the liquid phase at 20°C in
the presence of small additions of benzene.   Great care was taken
to purify the hexane before radiolysis.   It was washed with oleum,
alkaline solution and water, dried with $CaCl_2$, passed through
silica gel and distilled.   Benzene used was of cryoscopic grade
and thiophane free.   Solutions of benzene in hexane (10^{-4} to
10^{-1} mole/litre) were placed in special ampules.   Before sealing,
air was removed from the solutions by repeated freezing to -196°C
and melting in high vacuum (5×10^{-3} mm Hg).   After sealing, all
ampules were irradiated simultaneously with γ-rays for 80 h using
Co^{60}.   Radiation dosage was 4×10^{15} eV/sec cm^3.   It is shown
that yields of products resulting from the rupture of C – H bonds,

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S/204/61/001/005/008/008
E075/E484

γ-radiolysis of n-hexane ...

i.e. H_2, C_6H_{12}, C_8H_{18} - $C_{12}H_{26}$ and C_2-C_4 fractions, begin to decrease for the solutions containing 10^{-4} mole/litre of benzene. Practically no further changes in the yields occur for benzene concentrations of about 10^{-3} mole/litre and upwards. Thus the solutions become "saturated" with the radiation inhibitor, the maximum decrease in the yields of hydrogen being about 20%. The yields of heavy radiolysis products and hexane are also decreased by about 20% irrespective of the chemical mechanism in which they were formed. The constancy of composition of the heavy residue was checked by mass spectroscopy. For the products forming when C-C bonds are ruptured, i.e. C_2 - C_4 fractions, the yields are lowered only by 14%. In this case benzene shows less inhibiting action. Since the percentage of various fractions is approximately the same for all C_2 - C_4 fractions, it is inferred that the inhibition affects equally odd and even carbon numbered hydro-carbons. The authors explain the fact that the inhibiting action does not depend on differences in chemical mechanisms of product formation, by postulating that the inhibitor accepts at least a part of excitation energy from molecules, radicals or ions

Card 2/3

33590

γ-radiolysis of n-hexane ...

S/204/61/001/005/008/008
E075/E484

directly from excited electronic levels before the energy is transmitted to vibrational levels, which establishes conditions for chemical reactions. Further process of decomposition of excited species does not depend on the presence of small amounts of inhibitors. Consequently the composition of stable radiolysis products h a r d l y c h a n g e s. Acknowledgments are expressed to N.M.Rytova for her assistance. There are 2 figures, 2 tables and 12 references: 5 Soviet-bloc and 7 non-Soviet-bloc. The four most recent references to English language publications read as follows: Ref.4: F.H.Krenz. Nature, v.176, 1955, 1113; Ref.5: M. Burton, S. Lipsky, M.P.Reddy. J. Chem. Phys., v.26, 1957, 1337; Ref.6: G. Freeman. J. Chem. Phys., v.33, 1960, 71; Ref.7: D.R.Kalkwarf. Nucleonics, v.18, no.5, 1960, 76.

ASSOCIATION: Institut neftekhimicheskogo sinteza AN SSSR
(Institute of Petrochemical Synthesis AS USSR)
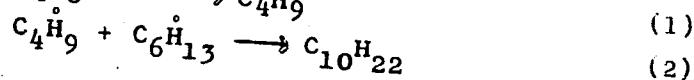
SUBMITTED: September 5, 1961

Card: 3/3

AUTHORS: Belikova, N.A., Berezkin, V.G., Polak, L.S.

TITLE: Investigation of the recombination products of alkyl radicals in the liquid phase radiolysis of n-hexane

PERIODICAL: Neftekhimiya, v.1, no.6, 1961, 828-835

TEXT: The authors investigated the composition of dimeric products formed on γ-radiolysis of pure liquid n-hexane, with and without the addition of butylene, at +20 and -77°C. Five isomers of dodecane were synthetized (four of them for the first time) and used as calibration standards in the analysis of the products resulting from the combination of the following radicals: R_1 $CH_3(CH_2)_4\overset{\bullet}{C}H_2$; R_2 $CH_3(CH_2)_3\overset{\bullet}{C}HCH_3$ and R_3 $CH_3(CH_2)_2\overset{\bullet}{C}HCH_2CH_3$. It was found that a decrease in the temperature of irradiation leads to a relative increase in the content of products of recombination of hexyl radicals with fragment radicals in $C_9 - C_{12}$ fraction. For the radiolysis in the presence of butylene there was a sharp increase in the absolute and relative content of saturated C_{10} hydrocarbons (to 43 - 49%) in $C_9 - C_{12}$ fraction. This effect was explained by the occurrence of the following

Card 1/3

Investigation of the recombination ... S/204/61/001/006/003/004
reactions   E075/E436

$$C_4H_8 + \overset{\circ}{H} \longrightarrow C_4\overset{\circ}{H}_9 \tag{1}$$
$$C_4\overset{\circ}{H}_9 + C_6\overset{\circ}{H}_{13} \longrightarrow C_{10}H_{22} \tag{2}$$

It was established that thermal hydrogen atoms join the
unsaturated products leading to the formation of aliphatic
radicals. It was shown that concentrations of R_2 and R_3 at
+20 °C is about 3.5 times that of R_1 and that the concentration
of R_2 and R_3 are equal. At -77 °C, $R_2/R_1 \approx R_3/R_1 \sim 2$ and
$R_2 \cong R_3$. The quantity of n-dodecane $(R_1 + R_1)$ formed was 10 times
less than that of products $R_1 + R_2$ and $R_1 + R_3$ at 20 °C and
8 times less at -77 °C, whilst the calculated concentration of R_1
was 3.5 and 2 times less than the concentrations of R_2 and R_3
respectively. By changing the temperature from +20 to -77 °C the
yield of isomers formed from the secondary radicals fell by
2.2 to 2.4 times and the yield of "primary" products almost did
not change. There are 5 tables.

Card 2/3

BEREZKIN, V.G.; POLAK, L.S.

Use of gas chromatography in the study of the kinetics of chemical reactions. Chromatographic analysis of the products of alkane radiolysis. Kin. i kat. 2 no.2:285-291 Mr-Ap '61.   (MIRA 14:6)

1. Institut neftekhimicheskogo sinteza AN SSSR.
(Gas chromatography)
(Paraffins)
(Chemical reaction, Rate of)

LYASHENKO, I.N.; NAMETKIN, N.S.; POLAK, L.S.; TOPCHIYEV, A.V.; FEL'DMAN, A.S.; CHERNYSHEVA, T.I.

Catalytic and radiation polymerization and copolymerization of allylhydrosilanes. Vysokom.soed. 3 no.6:833-840 Je '61.

(MIRA 14:6)

1. Institut neftekhimicheskogo sinteza AN SSSR.
(Silane)   (Polymerization)

BEREZKIN, V.G.; POLAK, L.S.

Chromatography of $C_5 - C_7$ hydrocarbons on the surface active substances OP-7. Khim.i tekh.topl.i masel 6 no.4:14-18 Ap '61.

(MIRA 14:3)

1. Institut neftekhimicheskogo sinteza AN SSSR.
        (Hydrocarbons—Analysis)
        (Chromatographic analysis)

S/020/61/136/001/032/037
B004/B056

AUTHORS: Kolbanovskiy, Yu. A., Polak, L. S., and Shlikhter, E. B.

TITLE: Gamma Radiolysis of n-Heptane Adsorbed on Oxide Catalysts

PERICDICAL: Doklady Akademii nauk SSSR, 1961, Vol. 136, No. 1, pp. 147-150

TEXT: The purpose of the present work was investigation of the particular features of radiolysis of adsorbed n-alkanes with n-heptane whose homogeneous radiolysis had already been thoroughly investigated (Refs. 1 - 3). Gamma radiolysis the method of which had already been described (Refs. 6, 7) was performed by means of the following catalysts. I: Pure Al_2O_3; II: aluminum-chromium catalyst, promoted with potassium oxide, 90 % Al_2O_3; 8 % Cr_2O_3, 2 % K_2O; III: aluminum-molybdenum catalyst, 87 % Al_2O_3, 10 % MoO_3, 3 % basic sulfates; IV: cobalt-aluminum-molybdenum catalyst, 79 % Al_2O_3, 15.5 % MoO_3, 5.5 % CoO. Radiolysis at catalyst II was investigated in the case of rare surface occupation ($\theta \leqslant 1$) as well as in

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Gamma Radiolysis of n-Heptane Adsorbed on   S/020/61/136/001/032/037
Oxide Catalysts   B004/B056

the case of adsorption of several molecular layers. The other catalysts
were investigated with monomolecular surface coating ($\theta = 1$). Temperature
during the experiment was about $10^{\circ}C$ in which case heptane adsorption is
reversible and chemosorption does not occur. Fig. 1 shows for catalyst
II the increase ΔP in gas pressure with respect to 1 g heptane as depending
on β, which stands for the ratio of the electron fractions catalyst/heptane.
The break in the curve corresponds to the appearance of monomolecular
coating; this permits to determine the specific surface of catalysts by
means of this curve. If for homogeneous radiolysis ΔP is set equal to unity
then the following values of P_{rel} resulted for the catalysts. Catalyst I:

12.7; catalyst II: 2.0; catalyst III: 1.7; catalyst IV: 3.6. The linear
dependence of ΔP on β in the case of monomolecular covering proves that
energy transfer takes place only in the monomolecular layer. Rate of
radiolysis for the layers above is equal to the rate of the homogeneous
process. From a paper of the authors (Ref. 6) on epr spectra of catalyst
systems it is concluded that the most active catalyst is the one whose
epr spectrum during irradiation in the presence of the hydrocarbon changes
the least with respect to the spectrum of the irradiated pure catalyst.

Card 2/5

Gamma Radiolysis of n-Heptane Adsorbed on   S/020/61/136/001/032/037
Oxide Catalysts   B004/B056

The $\Delta P = f(t)$ curve taken by an ЭПП-09 (EPP-09) recorder is not linear in
its first section which is attributed to impurities. The latter also are
assumed to be responsible that previously irradiated catalysts were con-
siderably less active. The probability of energy transfer from the catalyst
to adsorbed substance is estimated on the basis of the following processes.
1) $X_{ads} \overset{w}{\longrightarrow} X^{\cdot}$ (direct absorption of radiation by adsorbed substance);

2) $X^{\cdot} \longrightarrow X$ (deactivation processes, except chemical reactions); 3) $X^{\cdot} \longrightarrow$ pro-
ducts of chemical reactions; 4) catalyst $\overset{w}{\longrightarrow}$ catalyst$^{\cdot}$; 5) catalyst$^{\cdot} \longrightarrow$ cata-
lyst; 6) catalyst$^{\cdot}$ + $X_{ads} \longrightarrow$ catalyst + $X^{\cdot}_{ads}$. The rates of these processes
are: $W_1 = k_1' I\theta$; $W_2 = k_2[X^{\cdot}]$; $W_3 = k_3[X^{\cdot}]$; $W_4 = k_4' I$; $W_5 = k_5[D]$;

$W_6 = k_6[D]\theta$. $[D]$ denotes the concentration of elementary excitations in
the solid, I - radiative intensity. The following is deduced:
$W_3 = k_3 I\theta/(k_2 + k_3)[k_1' + k_4' k_6/(k_5 + k_6\theta)]$ and for homogeneous radiolysis:
$W_3' = k_1' k_3 I/(k_2 + k_3)$. In the case of $\theta = 1$, $W_3/W_3' = 1 + 1/(\varepsilon k_1/k_4)(k_5/k_6 + 1)$
holds, where ε stands for the ratio of absorbed radiation energy per 1 cm^3

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Gamma Radiolysis of n-Heptane Adsorbed on
Oxide Catalysts

$S/020/61/136/001/032/037$
$B004/B056$

heptane and catalyst. W_3/W_3' was determined experimentally; t was calculated according to Ref. 12, $k_1/k_4 \cong 1$. From these data the authors estimated the probability Z of total energy transfer: $Z = k_6/(k_5 + k_6)$. The values of Z for the respective catalysts are: I: 0.41, II: 0.032, III: 0.026, IV: 0.073. L. V. Pisarzhevskiy and A. I. Kitaygorodskiy are mentioned in the paper. The authors thank V. V. Shchekin and A. L. Klyachko for their collaboration, and Yu. L. Khait for his discussion. There are 2 figures, 2 tables, and 12 references: 6 Soviet, 4 US, and 1 Polish.

ASSOCIATION: Institut neftekhimicheskogo sinteza Akademii nauk SSSR
               (Institute of Petrochemical Synthesis of the Academy of
               Sciences USSR)

PRESENTED: July 5, 1960 by A. V. Topchiyev, Academician

SUBMITTED: July 5, 1960

Card 4/5

GUBERGRITS, M.Ya.; POLAK, L.S.; BRODSKAYA, B.Kh.; KUYV, K.A.; EMIN, Yu.B.

Electron paramagnetic resonance spectra of Baltic combustible shales.
Dokl. AN SSSR 136 no.4:824-827 F '61.   (MIRA 14:1)

1. Institut neftekhimicheskogo sinteza Akademii nauk SSSR 1
Institut khimii Akademii nauk Estonskoy SSR. Predstavleno aka-
demikom A.V. Topchiyevym.
                    (Shale—Spectra)

S/020/61/140/001/014/024
B103/B101

AUTHORS: Berezkin, V. G., and Polak, L. S.

TITLE: Peculiar features of gas - liquid chromatography of
                paraffins and aromatic hydrocarbons $C_7 - C_{12}$

PERIODICAL: Akademiya nauk SSSR. Doklady, v. 140, no. 1, 1961, 115-117

TEXT: The authors describe the analytical methods for hydrocarbons
$C_7 - C_{12}$ with the use of the Soviet methyl phenyl polysiloxane oil ФМС-4
(PFMS-4) (V. G. Berezkin, I. M. Kustanovich et al. DAN, 131, 593 (1960)).
Fig. 1 shows the scheme of the chromatographic apparatus. Column (3) and
flow meter (1) are controlled by a thermostat: (3) at elevated tempera-
ture, (1) at 30°C. Prior to (1), the hydrocarbon was converted. The
composition of the mixture to be analyzed was calculated on the basis of

$$i = \left[(S_i/n_i)/(\sum_{z=1}^{q} S_z/n_z)\right] \cdot 100 \ (\text{mole\%}),$$ where S_z is the area of the

chromatographic peak and n_z a correction coefficient equal to the number

Card 1/4

Peculiar features of gas...

of hydrogen atoms in the molecule. (3) is 5 m long and has a diameter of 6 mm. A diatomite brick (fraction 0.2 - 0.3 mm) was impregnated with PFMS-4 oil (weight ratio 100 : 15). The relative retention time α was determined at 140°C for 35 hydrocarbons $C_7 - C_{12}$, predominantly for

alkanes. It was found that at equal boiling point the α of aromatic compounds was much longer than that of alkanes. This is explained by a specific interaction between aromatic compounds and the phenyl groups of silicone oil. Therefore, the PFMS-4 oil is suitable for separating aromatic compounds from alkanes in fractions which had been produced earlier in a column with nonpolar, steady liquid phase. This oil separates the aromatic compounds much better than oil of the type ДС (DS) . (D. Jentzsch, G. Bergmann, Zs. analyt. Chem., 170, 239 (1959)), and it separates alkanes from aromatic hydrocarbons better than silicone E-301 (Ye-301) (A. A. Zhukhovitskiy, M. S. Semikina, N. M. Turkel'taub, Khimiya i tekhnologiya topliva masel, no. 11, 57 (1960)). The relative α in the same column at two different temperatures are connected by a linear relation: $\alpha(t_1) = K\alpha(t_2) + \beta$, where K and β are constants. The experi-

ments were conducted at $t_1 = 140°C$ and $t_2 = 90°C$. The proper choice of

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Peculiar features of gas...

S/020/61/140/001/014/024
B103/B101

temperature is important for the separation of a certain hydrocarbon group and for the determination of the optimum duration of analysis. The given function permits a calculation of the relative α for an arbitrary temperature on the basis of the relative α known for a certain temperature. A limited number of experiments is necessary to determine K and β. The linear function of relative α also holds for other steady liquid phases and for other classes of compounds. From the basic equation $\log \alpha_i = \log (P_{st}/P_i) + \log \gamma_i$, and from $\Delta H = KT_{boil}$, the function $\log \alpha = K \Delta T_{boil} \big| ^{-}I + g$ or $\log \alpha_i = A \cdot T_{boil} + B$ can be derived, where P_{st} and P_i are the pressures of the saturated vapor of the standard and of the corresponding compound, respectively, at test temperature, and γ_i is the relative coefficient of activity. There are 4 figures, 1 table, and 7 references: 3 Soviet and 4 non-Soviet. The three references to English-language publications read as follows: Ref. 2: D. Whate, Nature, 179, 1075 (1957); Ref. 3: C. J. Hardy, F. H. Pollard, J. Chromatogr., 2, 1 (1959); Ref. 5: C. E. Green, Nature, 180, 295 (1957).

Card 3/4

Peculiar features of gas...

ASSOCIATION: Institut neftekhimicheskogo sinteza Akademii nauk SSSR
                (Institute of Petrochemical Synthesis of the Academy of
                Sciences USSR)

PRESENTED: March 29, 1961, by A. V. Topchiyev, Academician

SUBMITTED: March 29, 1961

Fig. 1.   Scheme of the chromatographic apparatus

Legend: (1) Flow meter, (2) device for introducing the sample, (3)
chromatographic column, (4) converter, (5) recording device, (6) and (7)
thermostats.

Fig.1
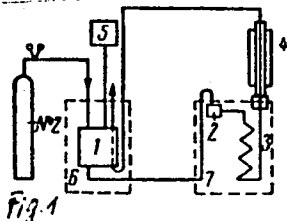
Card 4/4

BEREZKIN, V.G.; MYSAK, A.YE.; POLAK, L.S.

Radiolysis of n-hexane within the range of low integral doses
(3.10^{18} - 1.10^{20} ev/ml). Dokl. AN SSSR 141 no.6:1397-1399 D
'61.   (MIRA 14:12)

1. Predstavleno akademikom A.V.Topchiyevym.
                        (Hexane) (Radiation)

TOPCHIYEV, A.V., POLAK, L.S.

Production of olefins by the action of ionizing radiation on raw petroleum at 300-500 degrees C.

Report presented at the 12th ᵕonference on high molecular weights compounds devoted to monomers, Baku, 3-7 April 62

POLAK, L.S.

SESSION B—6—2 : Radiation Chemistry in Two-Phase Systems

(a)

Radiolysis of Hydrocarbons Absorbed on Semi-Conductor Catalysts

A. V. Topchiev, L. S. Polak and Yu. A. Kolbanovskii

Homogeneous and heterogeneous catalysts are agents which contribute to the increase of rates and which enhance the selectivity of radiation-chemical processes. In the presence of catalysts it is possible to increase the effectiveness of utilization of a given radiation, and simultaneously to increase the degree of product conversion. The conditions of energy transfer from the volume of the solid catalyst to the absorbed substance determine the reaction rate on the surface. The lack of increased rates outside the monolayer points to the specific nature of surface reactions and to the unimportant role of photoelectrons in the reaction.

The relative activity of a number of oxide catalysts was determined on the basis of the formal kinetic scheme for the calculation of the probability of the energy transfer in radiation-chemical processes in the absorbed state. When the radiation-chemical process is carried out in the presence of commercial catalysts, one obtains a 5-10-fold increase of the gas product yield in the radiolysis of alkanes.

An attempt has been made to calculate, on the basis of an activation model, the fundamental rules of the radiolysis of hydrocarbons adsorbed on semi-conductor catalysts; the results of the calculations agree qualitatively with the experimental results.

Radiochemical Laboratory of the Institute for Synthesis of Naphthochemicals Academy of Sciences of the USSR, Moscow

POLAK, L. S.

Radical Reactions and Energy Transfer in the Radiolysis of Hydrocarbons

𝒬

L. S. Polak

The radiolysis of hydrocarbons in various phases and the peculiarities of stabilized alkyl radicals have revealed regularities in radical reactions and can be subjected to kinetic analysis. The following factors have been explained: the conditions of competition between the radical and monomolecular reactions; the effect of the structure of alkyl radicals on the process of their dimerization; the part played by hot hydrogen atoms, and by unsaturated products in the radiolytic reactions. The balance of all products has been derived for the initial stages of radiolysis at very small integral doses (~10¹² eV/cm³) and a radiolytic mechanism has been put forward. The relationship between the formation of radicals and the excitation of molecules has been elucidated, as well as the ratio of the energy of excitation of electronic levels to the ionization potential, characteristic of alkanes.

Energy transfer during radiolysis in the presence of small (~10⁻⁵-10⁻⁹ mole/litre) additions of excitation acceptors (aromatic compounds, unsaturated and other systems with π-electrons), reduces radiolysis. It was shown that, in all cases, such an inhibition of the radiolysis of non-polar liquids, which are transparent to ultra-violet light depends on the 2/3 power of concentration, i.e., it is inversely proportional to the mean square distance between the excited molecule and the acceptor molecule. The removal of excitation from the electronic degree of freedom takes place earlier than the chemical process.

A direct electromagnetic mechanism of such transfer is suggested, and the quantum-mechanical calculation of this mechanism is given. The law of excitation transfer not only describes completely the known experimental data, but also has made it possible to forecast both the more complex concentration dependence and the relation between the phenomenon in question and the density of energy levels of molecules which are excitation acceptors. The theory of energy transfer in polar liquids and in the solid phase is possible. Excitation and analogous mechanisms are discussed.

Radiochemical Laboratory of the Institute for Synthesis of Naphthochemicals, Academy of Sciences of the U.S.S.R., Moscow

POLAK, L.S., doktor fiziko-matem. nauk, otv. red.; BUGAYENKO, L.T., red.; TSIVENKO, V.I., red.; KASHINA, P.S., tekhn. red.

[Proceedings of the Second All-Union conference on Radiation Chemistry]Trudy Vtorogo Vsesoiuznogo soveshchaniia po radiatsionnoi khimii. Moskva, Izd-vo Akad. nauk SSSR, 1962. 756 p.
(MIRA 15:8)

1. Vsesoyuznoye soveshchaniye po radiatsionnoy khimii. 2d, Moscow, 1960. 2. Institut neftekhimicheskogo sinteza Akademii nauk SSSR (for Polak).
(Radiochemistry-Congresses)

43223
S/844/62/000/000/008/129
D290/D307

AUTHORS: Kolbanovskiy, Yu. A. and Polak, L. S.

TITLE: The transfer of excitation in intramolecular radiolytic reactions

SOURCE: Trudy II Vsesoyuznogo soveshchaniya po radiatsionnoy khimii. Ed. by L. S. Polak. Moscow, Izd-vo AN SSSR, 1962, 64-69

TEXT: Various methods of energy transfer connected with inhibition of radiolytic reactions in nonpolar liquid are considered. A system of equations is proposed for the inhibition of radiolytic reactions, showing that

$$\frac{1}{G} \sim c_u^{n/3} \, , \quad \text{and} \quad c_u^{n/3} = \frac{1}{r^n}$$

Card 1/2

S/844/62/000/000/010/129
D290/D307

AUTHORS: Polak, L. S. and Shcherbakova, A. S.

TITLE: Low temperature radiolysis of hexane and cyclohexane in
           the presence of small amounts of benzene and dibenzyl-
           sulfide

SOURCE: Trudy II Vsesoyuznogo soveshchaniya po radiatsionnoy khi-
           mii. Ed. by L. S. Polak. Moscow, Izd-vo AN SSSR, 1962,
           74-78

TEXT: This paper is the first in a series in which the authors in-
vestigate the possibility of acceptors of excitation inhibiting the
formation of free radicals after irradiation in the solid phase at
$-196°C$. Small amounts (10^{-4} - 5×10^{-3} M) of the excitation accep-
tors (benzene and dibenzylsulfide) were added to n-hexane and cyclo-
hexane; the mean distance between molecules of the additives was in
the range of 60 - 200 Å. The specimens were irradiated using a
Co^{60} source with a dose of 20 Mr and EPR spectra were taken at

Card 1/2

Low temperature radiolysis ...   S/844/62/000/000/010/129
D290/D307

-196°C. The presence of excitation acceptors led to a decrease of up to 30% in the radical yields; dibenzylsulfide also caused changes in the EPR hyperfine structure. The relative changes of amplitude of the hyperfine structure lines were inversely proportional to the mean distance between the molecules of the additive. The addition of iodine did not change the EPR spectra; this fact can be explained if we assume that iodine can only accept molecular excitation that leads to disruption of the molecules. There are 5 figures.

ASSOCIATION: Institut neftekhimicheskogo sinteza AN SSSR (Institute of Petrochemical Synthesis, AS USSR)

Card 2/2

S/844/62/000/000/012/129
D290/D307

AUTHORS: Vereshchinskiy, I. V., Glazunov, P. Ya., Kustanovich, I. M. and Polak, L. S.

TITLE: Emission spectra of liquids and gases after irradiation with fast electrons

SOURCE: Trudy II Vsesoyuznogo soveshchaniya po radiatsionnoy khimii. Ed. by L. S. Polak. Moscow, Izd-vo AN SSSR, 1962, 83-86

TEXT: Visible and ultraviolet emission spectra of various liquids and gases after irradiation with fast electrons (700 – 800 kev) were studied. Great care was taken to exclude any impurities with known emission spectra in this region and to prevent Cherenkov radiation entering the spectrograph. The dose rate was measured by formate dosimetry and was about 3.9×10^{20} ev/sec. No previously unknown radiations were detected after irradiation of air, nitrogen, methane, propane, or ethylene. Irradiation of n-pentane produced a very broad emission band at about 3900 Å extending from

Card 1/2

Emission spectra of ...

S/844/62/000/000/012/129
D290/D307

4800 to 2400 $\overset{o}{A}$; irradiation of water produced a similar band but at slightly shorter wavelengths. The emission is very weak (the energy yield is less than 1.5×10^{-6} of the energy input in both cases). Further experimental evidence is required before the cause of the emission can be established. There are 2 figures.

ASSOCIATION: Institut neftekhimicheskogo sinteza AN SSSR (Institute of Petrochemical Synthesis, AS USSR); Institut fizicheskoy khimii AN SSSR (Institute of Physical Chemistry, AS USSR)

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S/844/62/000/000/048/129
D287/D307

AUTHOR: Polak, L. S.

TITLE: Physical and chemical characteristics of hydrocarbon
            radiolysis processes

SOURCE: Trudy II Vsesoyuznogo soveshchaniya po radiatsionnoy khi-
            mii. Ed. by L. S. Polak. Moscow, Izd-vo AN SSSR, 1962,
            282-294

TEXT: This article reviews some aspects of the radiolysis of hy-
drocarbons on the basis of Western and Soviet work. The following
topics are discussed: peimary processes during the radiolysis of
hydrocarbons, basic experimental data on the process, characteris-
tics of radiolysis reactions, reactions of free alkyl radicals dur-
ing radiolysis, the effect of temperature and phases on the process,
energy transfers, radiolysis of hydrocarbons adsorbed on solid sur-
faces (e.g. on catalysts) and reactions of stabilized hydrocarbon
radicals (formed during radiolysis processes). There are 74 refe-
rences.

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Physical and chemical ... $\qquad$ 3/844/62/000/000/048/129
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ASSOCIATION: Institut neftekhimicheskogo sinteza AN SSSR (Insti-
               tute of Petrochemical Synthesis, AS USSR)

Card 2/2

43234
S/844/62/000/000/050/129
D287/D307

AUTHORS: Topchiyev, A. V., Vereshchinskiy, I. V.m Glazunov, P. Ya.,
           Glushnev, V. Ye., Polak, L. S., Ryabchikova, G. G., Si-
           birskaya, G. K., Timofeyev, V. D. and Chernyak, N. Ya.

TITLE: Thermal cracking of hydrocarbons induced by irradiation

SOURCE: Trudy II Vsesoyuznogo soveshchaniya po radiatsionnoy khi-
           mii. Ed. by L. S. Polak. Moscow, Izd-vo AN SSSR, 1962,
           304-307

TEXT: The effect of irradiation on thermal cracking of heptane at
thermal cracking temperatures was studied. The experiments were
carried out in a countercurrent reactor, at constant throughput of
the gas, using irradiation dosages of 7×10^{15} ev/sec/1 cm^3 heptane.
The rate of formation of gaseous products during radiation-induced
and ordinary thermal cracking at 400 - 600°C was influenced by the
reaction temperature. At temperatures above 550°C the relationship
between the yield of products obtained by radiation and those ob-
tained by ordinary thermal cracking was in a 4:1 ratio and radia-

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Thermal cracking of ...

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tion-induced processes could therefore be carried out at much lower temperatures (150 - 220°C) than ordinary thermal cracking processes (550 - 600°C). Activation energy requirements also compared favorably (21 kcal/mole as against ~60 kcal/mole for thermal cracking). The yield of gaseous and liquid unsaturated compounds increased sharply with temperature and reached ~15,000 mol/100 ev at ~600°C. At temperatures ~800°C the radiation yield became lower. The yield of unsaturated compounds increased sharply with temperature and reached 80% (as against 50 - 55% during ordinary thermal cracking). Optimum conditions for the above process were high dosage irradiation and short contact times. There are 3 figures.

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43235
S/844/62/000/000/052/129
D287/D307

5.3300

AUTHORS: Berezkin, V. G., Polak, L. S., and Shakhray, V. A.

TITLE: Investigations of the mechanism of formation of heavy radiolysis products of hexane in liquid and solid phases

SOURCE: Trudy II Vsesoyuznogo soveshchaniya po radiatsionnoy khimii. Ed. by L. S. Polak. Moscow, Izd-vo AN SSSR, 1962, 312-316

TEXT: The C_9-C_{12} fractions, obtained during the radiolysis of hexane, were analyzed by gas-liquid chromatography, using the silicon oil ПФМС-4 (PFMS-4) as the stationary liquid phases. The experiments were carried out at 150°C, the efficiency of the 5 m long, 6 mm diameter column being approximately 3000 theoretical plates, N_2 was used as carrier (accuracy of analysis: $\pm$ 5%). Hexane samples irradiated with a dose of 1.7 x 10^{21} ev/g were subjected to preliminary concentration at -5°C. The degree of concentration of the samples varied within the limits 30 - 40. Experimental data ob-

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D287/D307

Investigations of the ...

tained were in good agreement with previously published views on
the mechanism of radiolysis in the solid phase (DAN SSSR, 129,
1042 (1959)). Products obtained during irradiation of hexane with
10^{21} ev/g at room temperature make it possible to assume that for-
mation of C_{13} hydrocarbons is accompanied by the addition of a
CH_3-radical to the double bond of 2- and 3-hexanes and subsequent
recombination of the C_6 and C_7 radicals. The higher products are
isomeric and thus the ratio of the concentrations of primary radi-
cals to the total of secondary radicals at constant concentrations
of hexyl radicals can be calculated, by assuming that the concen-
tration of the products in irradiated hexane is directly proporti-
onal to the rate of the individual recombination reactions. Iden-
tical values for the secondary radicals at 195 and 77°K indicate
that the aggregate composition does not affect the ratio of con-
centrations of the radicals obtained during the cleavage of the
C-H bonds. The degree of probability of radical cleavage of va-
rious bonds in the starting molecule was calculated to clarify the
mechanism of primary processes during radiolysis and to be able to
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S/844/62/000/000/053/129
D204/D307

AUTHORS: Kolbanovskiy, Yu. A., Polak, L. S. and Shlikhter, E. B.

TITLE: A study of the radiolysis of hydrocarbons adsorbed on oxide hydrocarbons

SOURCE: Trudy II Vsesoyuznogo soveshchaniya po radiatsionnoy khimii. Ed. by L. S. Polak. Moscow, Izd-vo AN SSSR, 1962, 317-321

TEXT: The radiolysis kinetics of n-heptane were studied, on oxide catalysts (Al_2O_3, Al_2O_3/Cr_2O_3 activated with K_2O, Al-Mo oxides and Co-Al-Mo oxides), under x ray irradiation; the degree of catalyst coverage (θ) being 0.6, 1.0 or >1 (multilayer adsorption) for the $Al_2O_3-Cr_2O_3$ catalyst, and with $\theta = 1$ in all other cases. The pressure was recorded continuously and its rate of increase rose linearly (for the Cr_2O_3/Al_2O_3 catalyst) with increasing ratio of the electron fractions of catalyst/heptane, to a maximum (corresponding to the completion of a monolayer), followed by a linear decrease,

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D204/D307

A study of the ...

showing that the energy absorbed by the catalyst is transmitted solely into the monolayer. The relative rates of radiolysis, Δp_{rel}, ranged from 1.7 to 12.7 ($\Delta p = 1$ in the absence of catalyst), being lower for previously irradiated catalysts. Al_2O_3 was most effective. From these and previous results (DAN SSSR, 129, 145 (1959)) it appears that the lesser the difference between the EPR spectra of irradiated (and covered with a monolayer) and pure catalysts, the more effective the catalyst. It is believed that the adsorption is under these conditions intermediate between physical and chemical types. The following sequence of events is envisaged: (1) absorption of energy by the directly adsorbed compound, (2) deactivation processes (other than chemical reaction), (3) chemical reaction, (4) absorption of energy by the catalyst, (5) energy loss processes within the catalyst, and (6) transfer of energy from the catalyst to the adsorbed hydrocarbons; the corresponding rate constants are denoted by $k_1, \ldots, k_6$. The probability of step (6), Z is shown to be $\frac{k_6}{k_5+k_6}$, and is linearly related to Δp_{rel}. The rela-

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S/844/62/000/000/054/129
D204/D307

AUTHORS: Kustanovich, I. M., Polak, L. S. and Rytova, N. M.

TITLE: A study of the luminescence spectra of irradiated hydro-
carbons

SOURCE: Trudy II Vsesoyuznogo soveshchaniya po radiatsionnoy khi-
mii. Ed. by L. S. Polak. Moscow, Izd-vo AN SSSR, 1962,
322-325

TEXT: The purpose of this work was to investigate the luminescence
spectra obtained during the warming up of some saturated hydrocar-
bons previously irradiated at low temperatures, to obtain informa-
tion regarding the source of this emission. In an example, purified
n-heptane and cyclohexane were γ irradiated at -196°C, with an in-
tegral dose of 15 Mrads. The resulting spectra showed in each case
2 partly overlapping maxima, situated at ~ 5000 and ~ 5400 Å for cy-
clohexane and at ~ 5100 and ~ 5500 Å for n-heptane. The emission is
ascribed to the recombination of free radicals of various struc-
tures, produced during irradiation and stabilized at the then low

Card 1/2

A study of the ...   S/844/62/000/000/054/129
D204/D307

temperatures. The presence of such radicals was confirmed by EPR spectroscopy. No emission was observed in the absence of free radicals. Previous irradiation of the specimens with visible light did not affect the luminescent spectra. The quantum yield for irradiated cyclohexane was found to be 1.3×10^{-6} photons per radical pair, which agrees with the theoretical value of $10^{-5} - 10^{-6}$ calculated for the probability of emission during recombination reactions. In the case of cyclohexane, $\sim 10^{-4} - 10^{-3}$ M additions of benzene largely increased the emission intensity, the latter increasing linearly with $\sqrt[3]{c}$ where c is the molar fraction of benzene. There are 2 figures.

ASSOCIATION: Institut neftekhimicheskogo sinteza AN SSSR (Institute of Petrochemical Synthesis, AS USSR)

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43241
S/844/62/000/000/081/129
D423/D307

AUTHORS: Topchiyev, A. V., Lyashenko, I. N., Nametkin, N. S., Polak,
          L. S., Teterina, M. P., Fel'dman, A. S. and Chernysheva,
          T. I.

TITLE: Radiation polymerization of allyl silanes

SOURCE: Trudy II Vsesoyuznogo soveshchaniy po radiatsionnoy khi-
          mii. Ed. by L. S. Polak. Moscow, Izd-vo AN SSSR, 1962,
          477-483

TEXT: A study was made of the radiation polymerization of organo-
silicon compounds in order to explain the mechanism of the process.
Mono-, di- and triallyl silanes were subjected to γ radiation from
Co^{60} at an intensity of 3.4 x 10^6 ev/cm^3.sec at $100^\circ C$. A similar se-
ries of tests was carried out using benzoyl peroxide as inhibitor.
Reactivity of the monomers increased with increasing number of the
allyl groups. Ir spectra of polydiallylethylsilanes showed that the
Si-H bond was preserved and that polymerization occurred only at
the expense of the double bond of the allyl group, in contrast to

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Radiation polymerization of ...

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D423/D307

polymerization of diallyl silane in the presence of platinized car-
bon, where new Si-J bonds were formed. The radical mechanism of the
process was confirmed. Solid, insoluble copolymers with acryloni-
trile were obtained, which did not melt below 300°C. The molar ra-
tio of the organosilicon component of the copolymer to the acrylo-
nitrile component increased with its increase in the initial mix-
ture, the dependence being stronger at lower dosages. Examination
of the ir spectra showed differences in structure between the co-
polymers of acrylonitrile with diallylethyl silane and ethylphenyl
silane. Copolymerization with styrene was studied, finding that the
yields of copolymer increased with dosage up to a constant maximum
of 50 - 60% for a dose of 28 - 42 x 10^{20} ev. The dependence of
yield, composition and molecular weight on the composition of the
initial mixture was also studied. It was concluded that polymeriza-
tion proceeded by a radical machanism. There are 8 figures and 1
table.

ASSOCIATION: Institut neftekhimicheskogo sintezy AN SSSR (Insti-
                tute of Petrochemical Synthesis, AS USSR)

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43244

S/844/62/000/000/105/129

D204/D307

AUTHORS: Gulyayev, G. V., Davydov, B. E., Krentsel', B. A., Pata-
lakh, I. I. and Polak L. S.

TITLE: The effect of radiation on semiconducting polymeric ma-
terials

SOURCE: Trudy II Vsesoyuznogo soveshchaniya po radiatsionnoy khi-
mii. Ed. by L. S. Polak. Moscow, Izd-vo AN SSSR, 1962,
621-624

TEXT: The effects of γ and electron irradiation on polymers based
on polyacrylonitrile (PAN) were studied, to determine the nature of
such materials. The (powdered) specimens were prepared by catalytic
or radiational polymerization; a polyacrylonitrile fabric was also
tested. The specific electron conductance (σ, 10^{-10} ohms^{-1}.cm^{-1}) of
hot-pressed (15,000 atm, 350°C) radiation polymerized PAN was lower
than that of catalytically polymerized PAN (~2.6 - 3.6) and de-
creased, by a factor of 10 - 15, with increasing power of the dose
used to induce polymerization (10^6 r, the rates were varied from 28

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S/844/62/000/000/116/129
D207/D307

AUTHORS: Shreyner, L. A. and Polak, L. S.

TITLE: Utilization of γ radiation for the visualization of plastically deformed regions in minerals and rocks

SOURCE: Trudy II Vsesoyuznogo soveshchaniya po radiatsionnoy khimii. Ed. by L. S. Polak. Moscow, Izd.vo AN SSSR, 1962, 674-676

TEXT: A review is given of the Western work dealing with the irradiation of calcite and marble with Co^{60} γ rays (17 x 10^6 r) which made visible the plastically deformed regions by color changes. The present authors applied this method successfully to marble and monocrystalline rocksalt in which the shapes and dimensions of the plastically deformed regions were thus clearly established. Ultramarine coloring of some natural rocksalt crystals is ascribed to the plastic deformation in the earth's crust which was followed by irradiation from natural sources. The studies were carried out at the Laboratoriya mekhaniki porod IGiRGI AN SSSR (Laboratory of Me-

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Utilization of γ radiation ...

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D207/D307

chanics of Rocks, IGiRGI, AS USSR) and at the Laboratoriya radiat-
sionnoy khimii INKhS AN SSSR (Radiation-Chemistry Laboratory,
INKhS, AS USSR). There is 1 figure.

ASSOCIATION: Institut geologii i razvedki goryuchikh iskopayemykh
AN SSSR (Institute of Geology and Prospecting for
Fuel Minerals, AS USSR); Institut neftekhimichesko
sinteza AN SSSR (Institute of Petrochemical Synthesis,
AS USSR).

Card 2/2

38714
S/191/62/000/007/001/011
B124/B144

/S.8061

AUTHORS: Nechitaylo, N. A., Polak, L. S., Sanin, P. I.

TITLE: Effect of gamma radiation on polypropylene in the presence
             of ionol as stabilizer

PERIODICAL: Plasticheskiye massy, no. 7, 1962, 3-11

TEXT: Gamma-irradiated isotactic polypropylene with and without stabilizer
was studied by infrared spectroscopy, and by thermomechanical and thermal
differential analysis.   Ionol (2,6-di-tert-butyl-4-methyl phenol) in
concentrations between 0.5 and 5% by weight was used as stabilizer.
Polypropylene was irradiated with Co^{60} both at 10^{-3} mm Hg and at atmospheric
pressure, using a dose of $1.1 \cdot 10^{16}$ ev/cm$^3 \cdot$sec, in the apparatus of the
Fiziko-khimicheskiy institut im. L. Ya. Karpova (Physicochemical
Institute imeni L. Ya. Karpov). The infrared spectra were taken with the
ИКС-14 (IKS-14) spectrograph, and the thermomechanical curves obtained
with a loading of 100 g/4 mm^2 at a heating rate of 80°C/hr. The
intrinsic viscosity was determined in Decalin at 120°C; the thermal

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S/191/62/000/007/001/011
B124/B144

Effect of gamma radiation on ...

differential analysis was carried out by N. S. Kurnakov's pyrometer with the use of a combined Pt-Au-Pd thermocouple and a weighed portion of 0.1-0.15 g. The infrared spectra were taken on tablets pressed at room temperature and on films obtained from the melt. The absence of the intensive band at 1720 cm^{-1} in the spectrum of the ionol-containing polypropylene films irradiated proves that ionol inhibits the formation of oxygen-containing groups and thus stabilizes the polymer irradiated. Specimens irradiated with 50 Mr without ionol were insoluble in Decalin at 120°C, whereas those with ionol were readily soluble even after doses of 100 and 200 Mr. This proves that ionol inhibits the cross-linking of molecules, which is confirmed by the thermomechanical curves. The intrinsic viscosity drops with increasing irradiation dose. Without stabilizer, the specimen heated in argon showed a decrease of the melt- ing point, while heating in air was attended also by strongly exothermic reactions reaching maxima at 190 and 217°C. These reactions disappeared on addition of ionol, the melting point then rising by about 10°C. The formation of various oxygen-containing groups or peroxides on heating in air is inhibited by the antioxidant, ionol. With increasing irradiation

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Effect of gamma radiation on ...   S/191/62/000/007/001/011
                                                    B124/B144

dose, polypropylene without stabilizer shows a decrease of melting point and of the area of endothermic peaks corresponding to the melting heats of polypropylene. Finally, an intensive exothermic process takes place above the melting point; the reaction heat of this process increases with increasing irradiation dose. With addition of ionol, the melting heat of polypropylene increases; no exothermic reaction above the melting point takes place owing to inhibition of the oxidation processes; the melting point drops but still lies some degrees above that of nonstabilized polypropylene. The optimum ionol concentration is about 1.5%. On irradiation of polypropylene, the melting point drops as the amorphous proportion increases. G. L. Slonimskiy is thanked for the thermomechanical analyses, and N. M. Rytov and M. A. Dzyubin for assistance. There are 7 figures and 4 tables. The most important English-language references are: W. H. Hawkins, et al. J. Appl. Polymer Sci. 1, 37 (1959); W. H. Hawkins et al. J. Polymer Sci. 28, No. 177, 439 (1958); W. H. Hawkins et al. J. Appl. Polymer Sci., 1, No. 1, 43 (1959).

Card 3/3

POLAK, L. S.; FILIPPOV, Ye. M.; KUZNETSOV, G. A.; ZHAVORONKOV, V. Ya.

Concerning the remarks of S. G. Troitskii, and V. L. Shashkin in "Geologiia i geofizika" no. 7, 1962. Geol. i geofiz. no.9: 125-126 '62.

(MIRA 15:10)

(Rocks—Density) (Gamma-ray spectrometry)
(Troitskii, S. G.) (Shashkin, V. L.)

POLAK, L.S.; KHMEL'NITSKIY, R.A.; CHERNYAK, N.Ya.

Mass spectra of some dodecane isomers. Neftekhimia 2   no.1:9-13
Ja-F '62.   (MIRA 15:5)

1. Institut neftekhimicheskogo sinteza AN SSSR.
            (Dodecane—Spectra)

RYTOVA, N.M.; TETERINA, M.P.; POLAK, L.S.

    Infrared absorption spectra of some dodecane isomers. Neftekhimia
    2 no.1:14-17 Ja-F '62.   (MIRA 15:5)

    1. Institut neftekhimicheskogo sinteza AN SSSR.
                  (Dodecane—Spectra)